## Test Specifications and Task List
### Suspension and Steering (Test A4)

<table>
<thead>
<tr>
<th>Content Area</th>
<th>Questions in Test</th>
<th>Percentage of Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Steering Systems Diagnosis and Repair</strong></td>
<td>10</td>
<td>25%</td>
</tr>
<tr>
<td>1. Steering Columns (3)</td>
<td></td>
<td></td>
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<tr>
<td>2. Steering Units (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Steering Linkage (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B. Suspension Systems Diagnosis and Repair</strong></td>
<td>11</td>
<td>28%</td>
</tr>
<tr>
<td>1. Front Suspensions (6)</td>
<td></td>
<td></td>
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<tr>
<td>2. Rear Suspensions (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C. Related Suspension and Steering Service</strong></td>
<td>2</td>
<td>5%</td>
</tr>
<tr>
<td><strong>D. Wheel Alignment Diagnosis, Adjustment, and Repair</strong></td>
<td>12</td>
<td>30%</td>
</tr>
<tr>
<td><strong>E. Wheel and Tire Diagnosis and Repair</strong></td>
<td>5</td>
<td>13%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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### A. Steering Systems Diagnosis and Repair (10 questions)

#### 1. Steering Columns (3 questions)

1. Diagnose steering column noises and steering effort concerns (including manual and electronic tilt and telescoping mechanisms); determine needed repairs.
2. Inspect and replace steering column, steering shaft U-joint(s), flexible coupling(s), collapsible columns, steering wheels (includes steering wheels and columns equipped with air bags and/or other steering wheel/column mounted controls, sensors, and components).
3. Disarm, enable, and properly handle airbag system components during vehicle service following manufacturers’ procedures.

#### 2. Steering Units (4 questions)

1. Diagnose steering gear (non-rack and pinion type) noises, binding, vibration, freeplay, steering effort, steering pull (lead), and leakage concerns; determine needed repairs.
2. Diagnose rack and pinion steering gear noises, binding, vibration, freeplay, steering effort, steering pull (lead), and leakage concerns; determine needed repairs.
3. Inspect power steering fluid level and condition; determine fluid type and adjust fluid level in accordance with vehicle manufacturers’ recommendations.
4. Inspect, adjust, align, and replace power steering pump belt(s) and tensioners.
5. Diagnose power steering pump noises, vibration, and fluid leakage; determine needed repairs.
6. Remove and replace power steering pump; inspect pump mounting and attaching brackets; remove and replace power steering pump pulley.
7. Inspect and replace power steering pump seals, gaskets, reservoir and valves.
8. Perform power steering system pressure and flow tests; determine needed repairs.
9. Inspect and replace power steering hoses, fittings, O-rings, coolers, and filters.
10. Remove and replace steering gear (non-rack and pinion type).
11. Remove and replace rack and pinion steering gear; inspect and replace mounting bushings and brackets.
12. Adjust steering gear (non-rack and pinion type) worm bearing preload and sector lash.
13. Inspect and replace steering gear (non-rack and pinion type) seals and gaskets.
15. Inspect and replace rack and pinion steering gear bellows/boots.
16. Flush, fill, and bleed power steering system.
17. Diagnose, inspect, repair or replace components of variable-assist steering systems.

3. Steering Linkage (3 questions)
1. Inspect and adjust (where applicable) front and rear steering linkage geometry (including parallelism and vehicle ride height).
2. Inspect and replace pitman arm.
3. Inspect and replace center link (relay rod/drag link/intermediate rod).
4. Inspect, adjust (where applicable), and replace idler arm(s) and mountings.
5. Inspect, replace, and adjust tie rods, tie rod sleeves/adjusters, clamps, and tie rod ends (sockets/bushings).
6. Inspect and replace steering linkage damper(s).

B. Suspension Systems Diagnosis and Repair (13 questions)

1. Front Suspensions (6 questions)
1. Diagnose front suspension system noises, body sway/roll, and ride height concerns; determine needed repairs.
2. Inspect and replace upper and lower control arms, bushings and shafts.
3. Inspect and replace rebound and jounce bumpers.
4. Inspect, adjust, and replace strut rods/radius arms (compression/tension), and bushings.
5. Inspect and replace upper and lower ball joints (with or without wear indicators).
6. Inspect non-independent front axle assembly for bending, warpage, and misalignment.
7. Inspect and replace front steering knuckle/spindle assemblies and steering arms.
8. Inspect and replace front suspension system coil springs and spring insulators (silencers).
9. Inspect and replace front suspension system leaf spring(s), leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.
10. Inspect, replace, and adjust front suspension system torsion bars and mounts.
11. Inspect and replace front stabilizer bar (sway bar) bushings, brackets, and links.
12. Inspect and replace front strut cartridge or assembly.
13. Inspect and replace front strut bearing and mount.

2. Rear Suspensions (5 questions)
1. Diagnose rear suspension system noises, body sway/roll, and ride height concerns; determine needed repairs.
2. Inspect and replace rear suspension system coil springs and spring insulators (silencers).
3. Inspect and replace rear suspension system lateral links/arms (track bars), control (trailing) arms, stabilizer bars (sway bars), bushings, and mounts.
4. Inspect and replace rear suspension system leaf spring(s), leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.
5. Inspect and replace rear rebound and jounce bumpers.
6. Inspect and replace rear strut cartridge or assembly, and upper mount assembly.
7. Inspect non-independent rear axle assembly for bending, warpage, and misalignment.
8. Inspect and replace rear ball joints and tie rod/toe link assemblies.
9. Inspect and replace rear knuckle/spindle assembly.

C. Related Suspension and Steering Service (2 questions)
1. Inspect and replace shock absorbers, mounts, and bushings.
2. Diagnose and service front and/or rear wheel bearings.
3. Diagnose, inspect, adjust, repair or replace components (including sensors, switches, and actuators) of electronically controlled suspension systems (including primary and supplemental air suspension and ride control systems).
4. Inspect and repair front and/or rear cradle (crossmember/subframe) mountings, bushings, brackets, and bolts.
5. Diagnose, inspect, adjust, repair or replace components (including sensors, switches, and actuators) of electronically controlled steering systems; initialize system as required.
6. Diagnose, inspect, repair or replace components of power steering idle speed compensation systems.

D. Wheel Alignment Diagnosis, Adjustment, and Repair (12 questions)
1. Diagnose vehicle wander, drift, pull, hard steering, bump steer (toe curve), memory steer, torque steer, and steering return concerns; determine needed repairs.
2. Measure vehicle ride height; determine needed repairs.
3. Measure front and rear wheel camber; determine needed repairs.
4. Adjust front and/or rear wheel camber on suspension systems with a camber adjustment.
5. Measure caster; determine needed repairs.
6. Adjust caster on suspension systems with a caster adjustment.
7. Measure and adjust front wheel toe.
8. Center steering wheel.
9. Measure toe-out-on-turns (turning radius/angle); determine needed repairs.
10. Measure SAI/KPI (steering axis inclination/king pin inclination); determine needed repairs.
11. Measure included angle; determine needed repairs.
12. Measure rear wheel toe; determine needed repairs or adjustments.
13. Measure thrust angle; determine needed repairs or adjustments.
14. Measure front wheelbase setback/offset; determine needed repairs or adjustments.
15. Check front and/or rear cradle (crossmember/subframe) alignment; determine needed repairs or adjustments.

**E. Wheel and Tire Diagnosis and Service (5 questions)**

1. Diagnose tire wear patterns; determine needed repairs.
2. Inspect tire condition, size, and application (load and speed ratings).
3. Measure and adjust tire air pressure.
4. Diagnose wheel/tire vibration, shimmy, and noise concerns; determine needed repairs.
5. Rotate tires/wheels and torque fasteners according to manufacturers’ recommendations.
6. Measure wheel, tire, axle flange, and hub runout (radial and lateral); determine needed repairs.
7. Diagnose tire pull (lead) problems; determine corrective actions.
8. Dismount and mount tire on wheel.
10. Test and diagnose tire pressure monitoring system; determine needed repairs.
SAMPLE QUESTIONS
SUSPENSION AND STEERING (TEST A4)

QUESTIONS:

1. The front end of a vehicle vibrates up and down while traveling at most road speeds.
   Technician A says that too much radial runout of the front tires could be the cause. Technician B says that static out-of-balance of the front tires could be the cause.
   Who is right?
   (A) A only * (C) Both A and B
   (B) B only  (D) Neither A nor B

2. A vehicle wanders while being driven on level roads.
   Technician A says that too much negative camber could be the cause.
   Technician B says that too much positive caster could be the cause.
   Who is right?
   (A) A only  (C) Both A and B
   (B) B only * (D) Neither A nor B

3. The alignment settings shown above would result in which of these conditions?
   (A) Left tire wear on inside; vehicle does not pull to either side
   * (B) Right tire wear on inside; vehicle pulls to left
   (C) Right tire wear on outside; vehicle pulls to left
   (D) Right tire wear on outside; left tire wear on inside; vehicle pulls to left

<table>
<thead>
<tr>
<th>READINGS</th>
<th>SPECS</th>
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<tbody>
<tr>
<td>Left</td>
<td>Right</td>
</tr>
<tr>
<td>Camber</td>
<td>- 1 1/2° or - 1° 30 min.</td>
</tr>
<tr>
<td>+ 3/4° or + 45 min.</td>
<td></td>
</tr>
<tr>
<td>Caster</td>
<td>0°</td>
</tr>
<tr>
<td>0°</td>
<td>0°</td>
</tr>
<tr>
<td>Toe-in</td>
<td>1/16” or .16mm</td>
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A4 Sample Questions (continued)

4. A vehicle with rack and pinion steering has a shimmy. 
   Technician A says that worn rack-to-frame mounting bushings could be the 
   cause. 
   Technician B says that loose inner or outer tie rod ends (sockets) could be the 
   cause. 
   Who is right? 
   *(A) A only  (C) Both A and B  
   (B) B only  (D) Neither A nor B

5. During a wheel alignment, a technician finds the toe-out-on-turns 
   (turning radius) to be incorrect. Which of these could be the cause? 
   (A) Bent pitman arm 
   (B) Bent tie rod 
   (C) Bent idler arm  
   *(D) Bent steering arm

6. A vehicle pulls to the right during braking. 
   Technician A says that a worn strut rod bushing could be the cause. 
   Technician B says that a bent right wheel could be the cause. 
   Who is right? 
   *(A) A only  (C) Both A and B  
   (B) B only  (D) Neither A nor B

7. Which of these should the technician do first when aligning a light truck 
   equipped with a torsion bar front suspension? 
   (A) Adjust the thrust angle 
   (B) Adjust the caster/camber 
   (C) Check/adjust the toe 
   *(D) Check/adjust the ride height (curb height).

8. A pressure test is being performed on a vehicle with power steering. The pres- 
   sure readings taken when the wheels are at the right and left stops are below 
   specs. The readings are normal when the tester shutoff valve is closed. 
   Technician A says that these readings could be caused by a bad steering gear. 
   Technician B says that these readings could be caused by a bad pump. 
   Who is right? 
   *(A) A only  (C) Both A and B  
   (B) B only  (D) Neither A nor B
9. The suspension shown above is being checked for ball joint wear. Technician A says that the check can be made with the front end jacked up at “X.” Technician B says that the check can be made with the front end jacked up at “Y.” Who is right?  
(A) A only  
* (B) B only  
(C) Both A and B  
(D) Neither A nor B

Question 10 is not like the ones above.  
It has the word EXCEPT. For this question, look for the choice that could NOT cause the described situation. Read the entire question carefully before choosing your answer.

10. All of these could cause tire wear if not within manufacturer’s specs EXCEPT:  
* (A) caster.  
(B) wheel balance.  
(C) toe-in.  
(D) camber.
### Test Specifications and Task List

#### Brakes (Test A5)

<table>
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<tr>
<th>Content Area</th>
<th>Questions in Test</th>
<th>Percentage of Test</th>
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<tbody>
<tr>
<td>A. Hydraulic System Diagnosis and Repair</td>
<td>12</td>
<td>27%</td>
</tr>
<tr>
<td>1. Master Cylinder (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Lines and Hoses (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Valves and Switches (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Bleeding, Flushing, and Leak Testing (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Drum Brake Diagnosis and Repair</td>
<td>5</td>
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<tr>
<td>C. Disc Brake Diagnosis and Repair</td>
<td>10</td>
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<tr>
<td>D. Power Assist Units Diagnosis and Repair</td>
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<td>E. Miscellaneous Systems Diagnosis and Repair</td>
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<tr>
<td>F. Electronic Brake Control Systems—Antilock Brake Systems (ABS) and Traction Control Systems TCS)—Diagnosis and Repair</td>
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#### A. Hydraulic System Diagnosis and Repair (12 questions)

##### 1. Master Cylinder (3 questions)

1. Diagnose poor stopping, dragging, high or low pedal, hard or spongy pedal caused by problems in the master cylinder; determine needed repairs.
2. Diagnose problems in the step bore master cylinder and internal valves (e.g. volume control devices, quick take-up valve, fast-fill valve, pressure regulating valve); determine needed repairs.
3. Measure and adjust master cylinder pushrod length.
4. Check master cylinder for failures by depressing brake pedal; determine needed repairs.
5. Diagnose the cause of master cylinder external fluid leakage.
6. Remove and replace master cylinder; bench bleed and test operation and install master cylinder; verify master cylinder function.

##### 2. Lines and Hoses (3 questions)

1. Diagnose poor stopping, pulling, or dragging caused by problems in the lines and hoses; determine needed repairs.
2. Inspect brake lines and fittings for leaks, dents, kinks, rust, cracks, or wear; inspect for loose fittings and supports; determine needed repairs.
3. Inspect flexible brake hoses for leaks, kinks, cracks, bulging, wear, or corrosion; inspect for loose fittings and supports; determine needed repairs.
4. Replace brake lines, hoses, fittings, and supports; fabricate brake lines using proper material and flaring procedures (double flare and ISO types).
5. Inspect brake lines and hoses for proper routing and support.

3. **Valves and Switches (3 questions)**
   1. Diagnose poor stopping, pulling, or dragging caused by problems in the hydraulic system valve(s); determine needed repairs.
   2. Inspect, test, and replace metering, proportioning, pressure differential, and combination valves.
   3. Inspect, test, replace, and adjust load or height sensing-type proportioning valve(s).
   4. Inspect, test, and replace brake warning light, switch, sensor and circuit.

4. **Bleeding, Flushing, and Leak Testing (3 questions)**
   1. Diagnose poor stopping, pulling, or dragging caused by problems in the brake fluid; determined needed repairs.
   2. Bleed and/or flush hydraulic system (manual, pressure, vacuum, or surge method).
   3. Pressure test brake hydraulic system.
   4. Select, handle, store, and install proper brake fluids (including silicone fluids).

B. **Drum Brake Diagnosis and Repair (5 questions)**
   1. Diagnose poor stopping, pulling, or dragging caused by drum brake hydraulic problems; determine needed repairs.
   2. Diagnose poor stopping, noise, pulling, grabbing, dragging, or pedal pulsation caused by drum brake mechanical problems; determine needed repairs.
   3. Remove, clean, inspect, and measure brake drums; follow manufacturers’ recommendations in determining need to machine or replace.
   4. Machine drums according to manufacturers’ procedures and specifications.
   5. Using proper safety procedures, remove, clean, and inspect brake shoes/linings, springs, pins, self-adjusters, levers, clips, brake backing (support) plates and other related brake hardware; determine needed repairs.
   6. Lubricate brake shoe support pads on backing (support) plate, self-adjuster mechanisms, and other brake hardware.
   7. Install brake shoes and related hardware.
   8. Pre-adjust brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings.
   9. Reinstall wheel, torque lug nuts, and make final checks and adjustments.

C. **Disc Brake Diagnosis and Repair (10 questions)**
   1. Diagnose poor stopping, pulling, or dragging caused by disc brake hydraulic problems; determine needed repairs.
   2. Diagnose poor stopping, noise, pulling, grabbing, dragging, pedal pulsation or pedal travel caused by disc brake mechanical problems; determine needed repairs.
   3. Retract integral parking brake caliper piston(s) according to manufacturers recommendations.
   4. Remove caliper assembly from mountings; inspect for leaks and damage to caliper housing.
A5 Task List (continued)

5. Clean, inspect, and measure caliper mountings and slides/pins for wear and damage.
6. Remove, clean, and inspect pads and retaining hardware; determine needed repairs, adjustments, and replacements.
7. Clean caliper assembly; inspect external parts for wear, rust, scoring, and damage; replace any damaged or worn parts; determine the need to repair or replace caliper assembly.
8. Clean, inspect, and measure rotor with a dial indicator and a micrometer; follow manufacturers’ recommendations in determining the need to index, machine or replace the rotor.
9. Remove and replace rotor.
10. Machine rotor, using on-car or off-car method, according to manufacturers’ procedures and specifications.
11. Install pads, calipers, and related attaching hardware; lubricate components following manufacturers’ procedures and specifications; bleed system.
12. Adjust calipers with integrated parking brakes according to manufacturers’ recommendations.
13. Fill master cylinder to proper level with recommended fluid; inspect caliper for leaks.
14. Reinstall wheel, torque lug nuts, and make final checks and adjustments.

D. Power Assist Units Diagnosis and Repair (4 questions)
1. Test pedal free travel with and without engine running to check power booster operation.
2. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.
3. Inspect the vacuum-type power booster unit for vacuum leaks and proper operation; inspect the check valve for proper operation; repair, adjust, or replace parts as necessary.
4. Inspect and test hydro-boost system and accumulator for leaks and proper operation; repair or replace parts as necessary; refill system.

E. Miscellaneous Systems (Pedal linkage, Wheel Bearings, Parking Brakes, Electrical, etc.) Diagnosis and Repair (7 questions)
1. Diagnose wheel bearing noises, wheel shimmy and vibration problems; determine needed repairs.
2. Remove, clean, inspect, repack wheel bearings, or replace wheel bearings and races; replace seals; replace hub and bearing assemblies; adjust wheel/hub bearings according to manufacturers’ specifications.
3. Check parking brake system; inspect cables and parts for wear, rust, and corrosion; clean or replace parts as necessary; lubricate assembly.
4. Adjust parking brake assembly; check operation.
5. Test the parking brake indicator light, switch and wiring.
6. Test, adjust, repair or replace brake stop light switch, lamps, and related circuits.
7. Inspect and test brake pedal linkage for binding, looseness, and adjustment; determine needed repairs.
F. Electronic Brake Control Systems: Antilock Brake Systems (ABS) and Traction Control Systems (TCS) Diagnosis and Repair (7 questions)

1. Follow manufacturers’ service and safety precautions when inspecting, testing and servicing ABS/TCS hydraulic, electrical, and mechanical components.
2. Diagnose poor stopping, wheel lock up, pedal feel and travel, pedal pulsation, and noise concerns associated with the ABS/TCS; determine needed repairs.
3. Observe ABS/TCS warning light(s) at startup and during road test; determine if further diagnosis is needed.
4. Diagnose ABS/TCS electronic control(s), components, and circuits using on-board diagnosis and/or recommended test equipment; determine needed repairs.
5. Bleed and/or flush the ABS/TCS hydraulic system following manufacturers’ procedures.
6. Remove and install ABS/TCS components following manufacturers’ procedures and specifications; observe proper placement of components and routing of wiring harness.
7. Test, diagnose and service ABS/TCS speed sensors (digital or analog), toothed ring (tone wheel), magnetic encoder, and circuits following manufacturers’ recommended procedures (includes output signal, resistance, shorts to voltage/ground, and frequency data).
8. Diagnose ABS/TCS braking concerns caused by vehicle modifications (wheel/tire size, curb height, final drive ratio, etc.) and other vehicle mechanical and electrical/electronic modifications (communication, security, and radio, etc.).
9. Repair wiring harness and connectors following manufacturers’ procedures.
SAMPLE QUESTIONS
BRAKES (TEST A5)

1. Which of these would most likely happen if the measurements in the set-up shown above varied from manufacturer’s specs?
   (A) Noisy Brake operation  * (C) Pulsating brake pedal
   (B) Brake grab or pull     (D) Low brake pedal

2. The brake pedal on a vehicle with power-assisted disc/drum brakes moves slowly to the floor during braking. Which of these could be the cause?
   * (A) A leaking master cylinder primary cup
   (B) A leaking power brake booster
   (C) A leaking master cylinder residual check valve
   (D) An internal leak in the combination valve

3. On a vehicle with disc/drum brakes, the front brakes grab quickly when light pedal pressure is applied. This could be caused by a bad:
   (A) proportioning valve.  * (C) metering valve.
   (B) pressure differential valve. (D) residual check valve.

4. On a vehicle with single piston, floating caliper disc brakes, the disc brake pad between the caliper piston and the rotor is badly worn. The other brake pad is only slightly worn.
   Technician A says that too much rotor runout could be the cause.
   Technician B says that a frozen caliper piston could be the cause.
   Who is right?
   (A) A only  * (C) Both A and B
   (B) B only     (D) Neither A nor B
5. When the brakes are applied, a vibration comes from the front of a vehicle with a disc/drum system. Which of these could be the cause?
   (A) Unequal tire pressure
   (B) Binding caliper slides
   * (C) Excessive rotor runout
   (D) A frozen caliper piston

6. A front disc brake rotor is slightly below minimum thickness specification after machining. The technician should:
   (A) reuse the rotor.
   * (B) replace the rotor.
   (C) apply a non-directional finish to the rotor.
   (D) machine the other front rotor to the same thickness.

7. A hydraulic brake line is leaking. Which of these is the correct repair?
   (A) Cut out the bad section and replace with new steel tubing using compression fittings.
   (B) Replace the leaking line with double-flared seamless copper tubing.
   (C) Cut out the bad section and replace with single-flared steel tubing using flare nuts and unions.
   * (D) Replace the leaking line with double-flared steel tubing.

8. The set-up shown above is used to check:
   (A) rotor parallelism.
   (B) wheel bearing adjustment.
   * (C) rotor lateral runout (wobble).
   (D) rotor face wear.
9. The drag on a vehicle’s drum brakes increases after each application until they lockup. Bleeding the system restores normal operation for a short time; then drag increases until the brakes lockup again. Which of these could be the cause?
   * (A) A blocked compensating port
   (B) A blocked breather port
   (C) Wrong brake shoe adjustment
   (D) Weak brake shoe return springs

10. With the brakes applied, the pedal moves down slightly when the engine is started on a vehicle with power brakes.
    Technician A says that the cause could be a leaking power brake booster diaphragm.
    Technician B says that the cause could be a stuck closed check valve on the power brake booster manifold.
    Who is right?
    (A) A only
    (B) B only
    (C) Both A and B
    * (D) Neither A nor B